ICNS

Conference 2007

System Engineering Results for System Wide Information Management (SWIM) using COTS Technologies

Vic Patel

Federal Aviation Administration

Steve Prescott

ORACLE

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Agenda

1. FAA Goals – SWIM COTS System Engineering Project
2. Solution Architecture
3. Results
   a. Scorecard
   b. Focus Area #1: COTS Demonstration
   c. Focus Area #2: Reliability, Availability, Scalability
   d. Focus Area #3: Security
   e. Focus Area #4: Weather Transactions
   f. Focus Area #5: Surveillance Transactions
   g. Focus Area #6: Infrastructure Management
4. Conclusions & Next Steps

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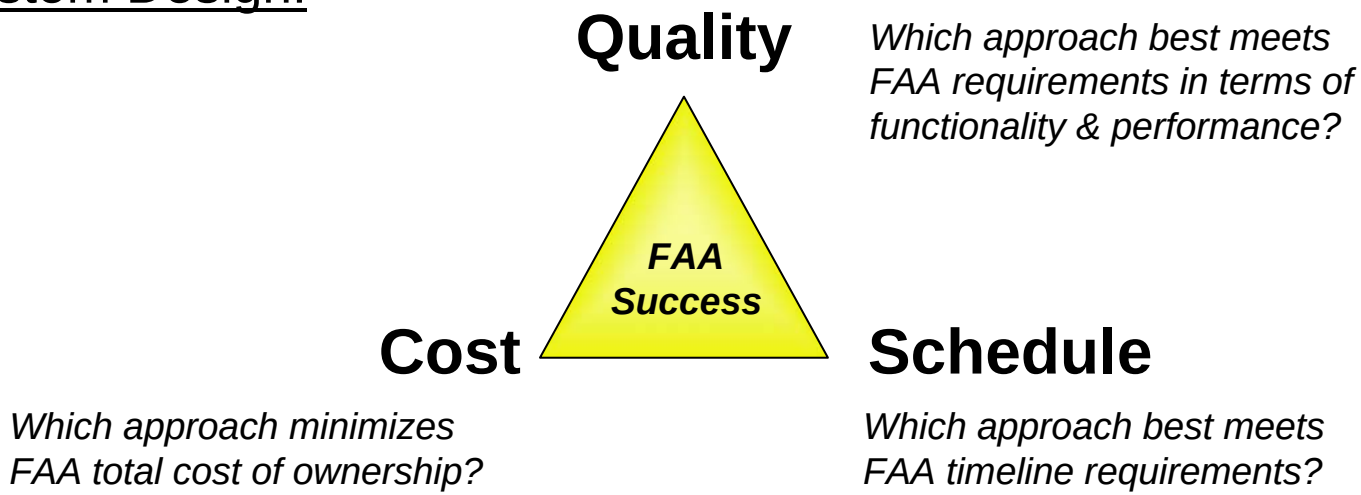
FAA Goals – SWIM System Engineering & COTS

COTS vs. Custom Design:



COTS – Questions To Answer:

a. Functionality: Can a COTS solution meet FAA functional requirements?
b. Robustness: Can a COTS solution provide a sufficiently robust infrastructure?
c. Security: Can a COTS solution adequately secure FAA information?
d. FAA Data: Can a COTS solution handle common FAA data?
e. Manageability: Can a COTS solution provide adequate management controls?

Focus Area of Solution Validation

COTS Demonstration	• Deploy a solution based on COTS • Document adherence to industry standards • Demonstrate interoperability (vendor neutrality)
Reliability, Availability, and Scalability	• Run for extended period to demonstrate stability • Simulate outages & workloads to stress the solution
Security	• Encrypt data • Protect data privacy • Authenticate & authorize users • Support user oversight of updates via workflow • Enforce security policies regarding web service
Weather Transactions	• Receive weather image and save in database • Display weather image for user in web browser
Surveillance Transactions	• Receive RADAR data and save in database • Forward info to user for real-time display in RTADS
Infrastructure Management	• Monitor status of infrastructure in real-time • Receive alert notification when thresholds trip

Participants

FAA	SWIM – Program Management
FAA	SWIM – Project Requirements Definition
Oracle	SWIM – Software, Design, and Development
Dell	SWIM – Server Hardware
EMC	SWIM – Storage Hardware – Candidate #1
Apple	SWIM – Storage Hardware – Candidate #2
Red Hat	SWIM – Operating System
F5	SWIM – Networking Hardware

FAA engaged a broad range of industry partners for this exercise

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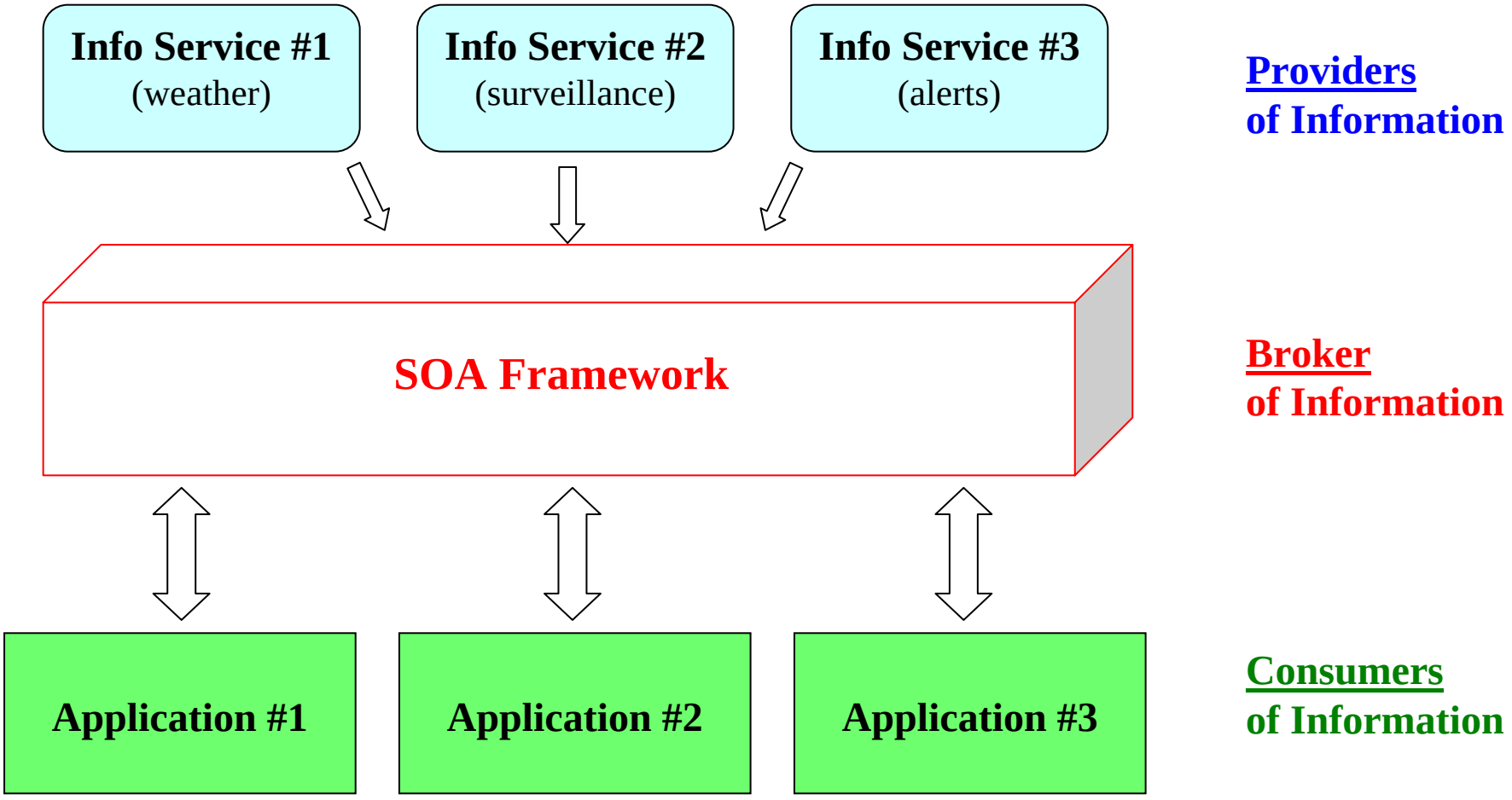
Architecture – Vision



SOA Framework is a broker between providers and consumers of information

Architecture – Controls Available (initial project did not exercise every control)

Service Controls:

- ✓ Application Repository
- ✓ Workflow
- ✓ Business Activity Monitoring
- ✓ Integration with Applications & Data

Information Controls:

- ✓ Information Storage (database)
- ✓ High Availability (mission critical)
- ✓ High Performance (real-time)
- ✓ Geographic Data Support (maps)

Security Controls:

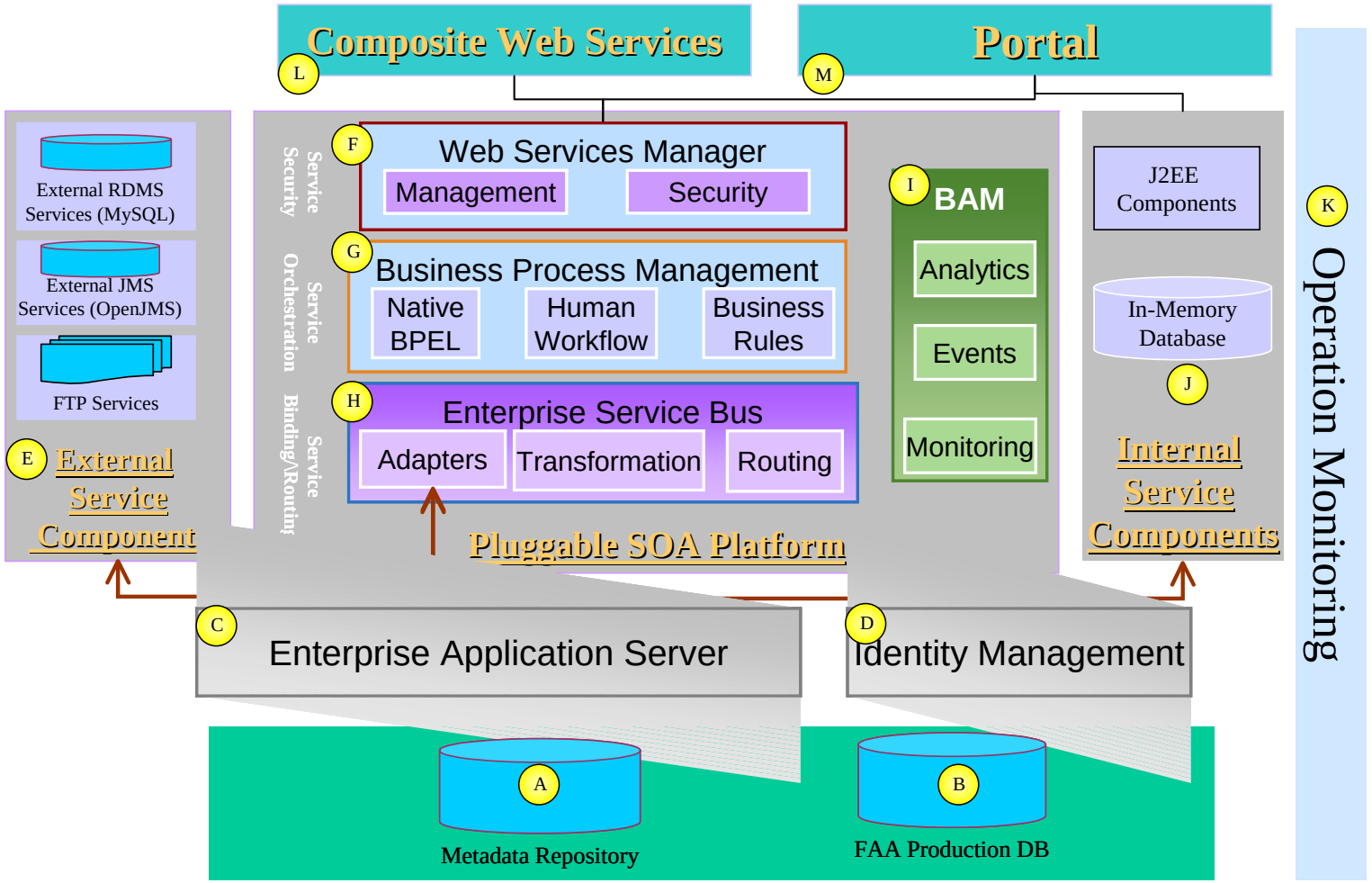
- ✓ User Authentication & Authorization
- ✓ Role-based Access Control
- ✓ Web Service Security
- ✓ Encryption of Data (At-Rest and In-Transit)
- ✓ Privacy of Data in Shared Storage
- ✓ Federated Access – External Users

Management Controls:

- ✓ Consolidated Dashboard for Mgmt
- ✓ Service Level Agreements – Enforce
- ✓ Automated Patching & Updates
- ✓ Diagnostic & Tuning Tools
- ✓ Policy Manager for Governance

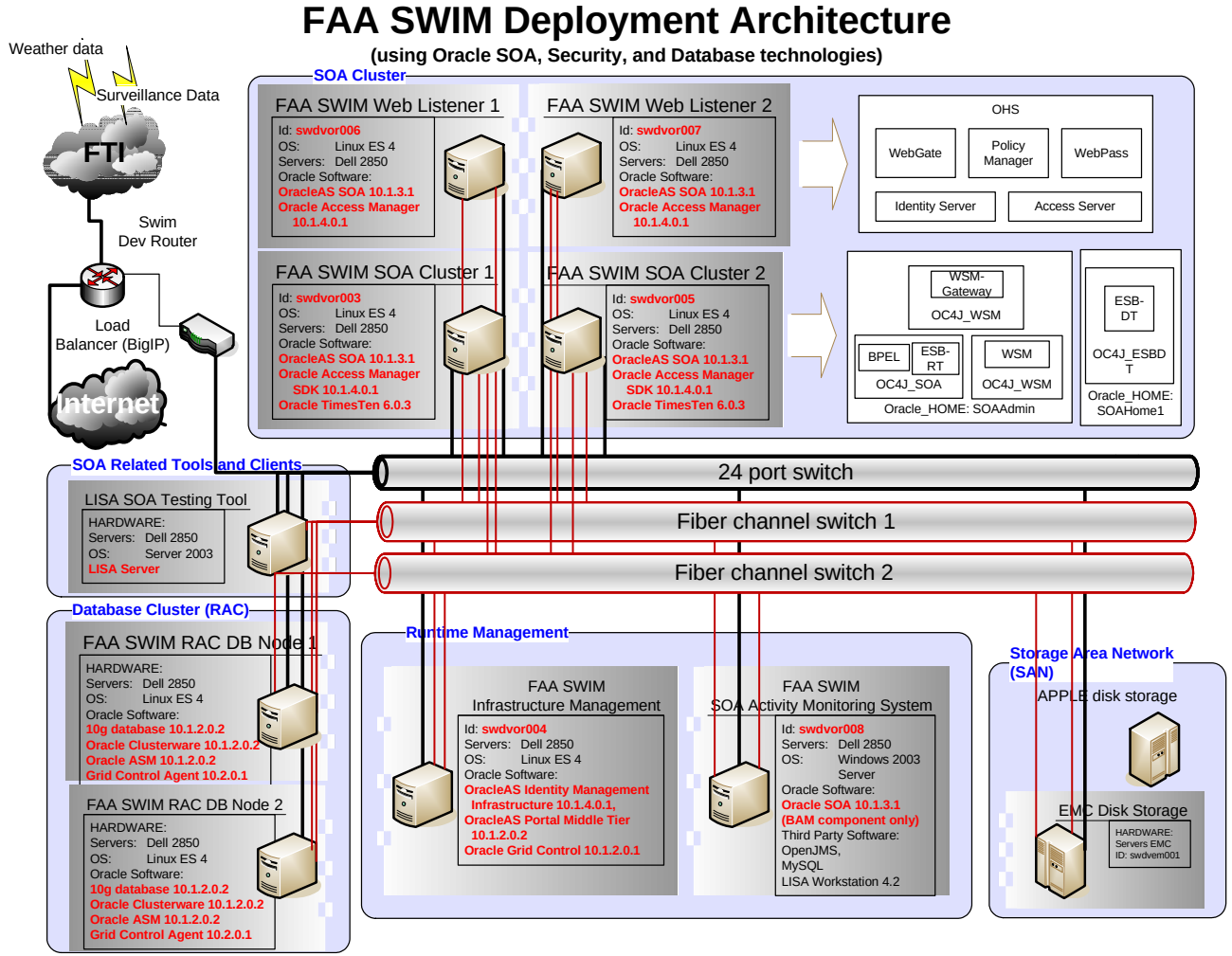
SWIM infrastructure provides the FAA with control in four important areas

Architecture – Logical Modules



A collection of COTS products was deployed to provide these services

Architecture – Physical Deployment



Eight servers at FAA Tech Center in NJ hosted this solution

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Results – Scorecard

COTS Demonstration	4 Use Cases	✓ Complete
Reliability, Availability, and Scalability	6 Use Cases	✓ Complete
Security	10 Use Cases	✓ Complete
Weather Transactions	7 Use Cases	✓ Complete
Surveillance Transactions	4 Use Cases	✓ Complete
Infrastructure Management	2 Use Cases	✓ Complete

FAA and its partners completed all 33 use-cases outlined at the project inception

Results – Focus Area #1: COTS Demonstration

Transactional Database	COTS Solution	✓ Complete
Metadata Repository	COTS Solution	✓ Complete
Application Server	COTS Solution	✓ Complete
Identity Management	COTS Solution	✓ Complete
Web Services Security	COTS Solution	✓ Complete
Business Process Management	COTS Solution	✓ Complete
Enterprise Service Bus	COTS Solution	✓ Complete
Business Activity Monitoring	COTS Solution	✓ Complete
In-memory Database	COTS Solution	✓ Complete
Operations Monitoring	COTS Solution	✓ Complete
Portal	COTS Solution	✓ Complete
Clustering of Databases & Application Servers	COTS Solution	✓ Complete
Public Key Infrastructure (PKI)	COTS Solution	✓ Complete
Secure Sockets Layer (SSL)	COTS Solution	✓ Complete
Integrated Development Environment (IDE)	COTS Solution	✓ Complete

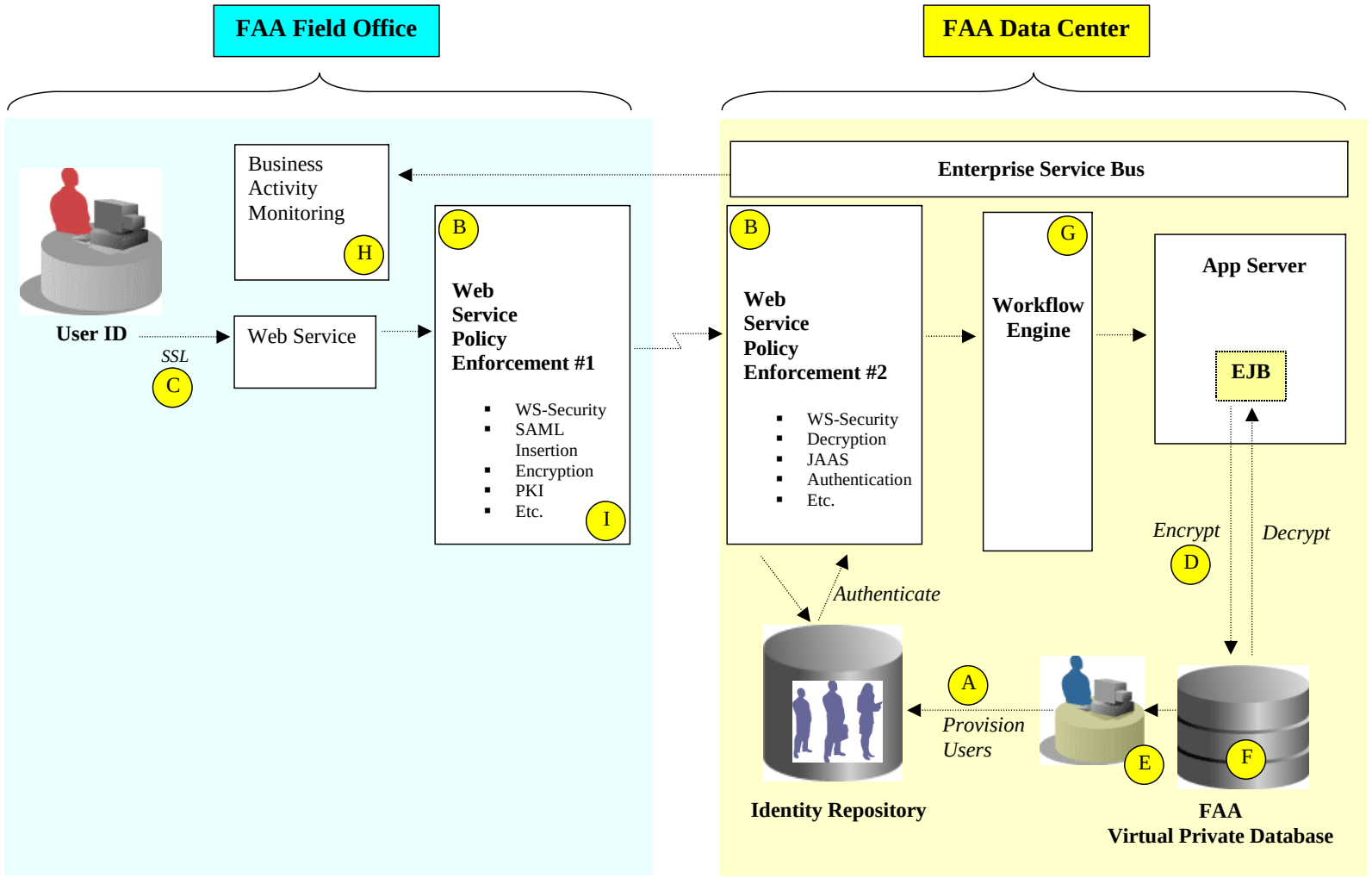
Solution makes broad use of COTS products & demonstrates interoperability

Results – Focus Area #2: Availability & Scalability

Extended Run	Ran solution continuously over 12-hour period with continuous transaction workload. Verified: - All components operational - Information flowing through system	✓ Complete
Database	Clustered databases. Verified proper response to these actions: - Disabling a database node - Adding a database node	✓ Complete
Workflow	Clustered workflow. Verified proper response to these actions: - Disabling a workflow node - Adding a workflow node	✓ Complete
Identity Management	Documented enterprise scalable solution	✓ Complete

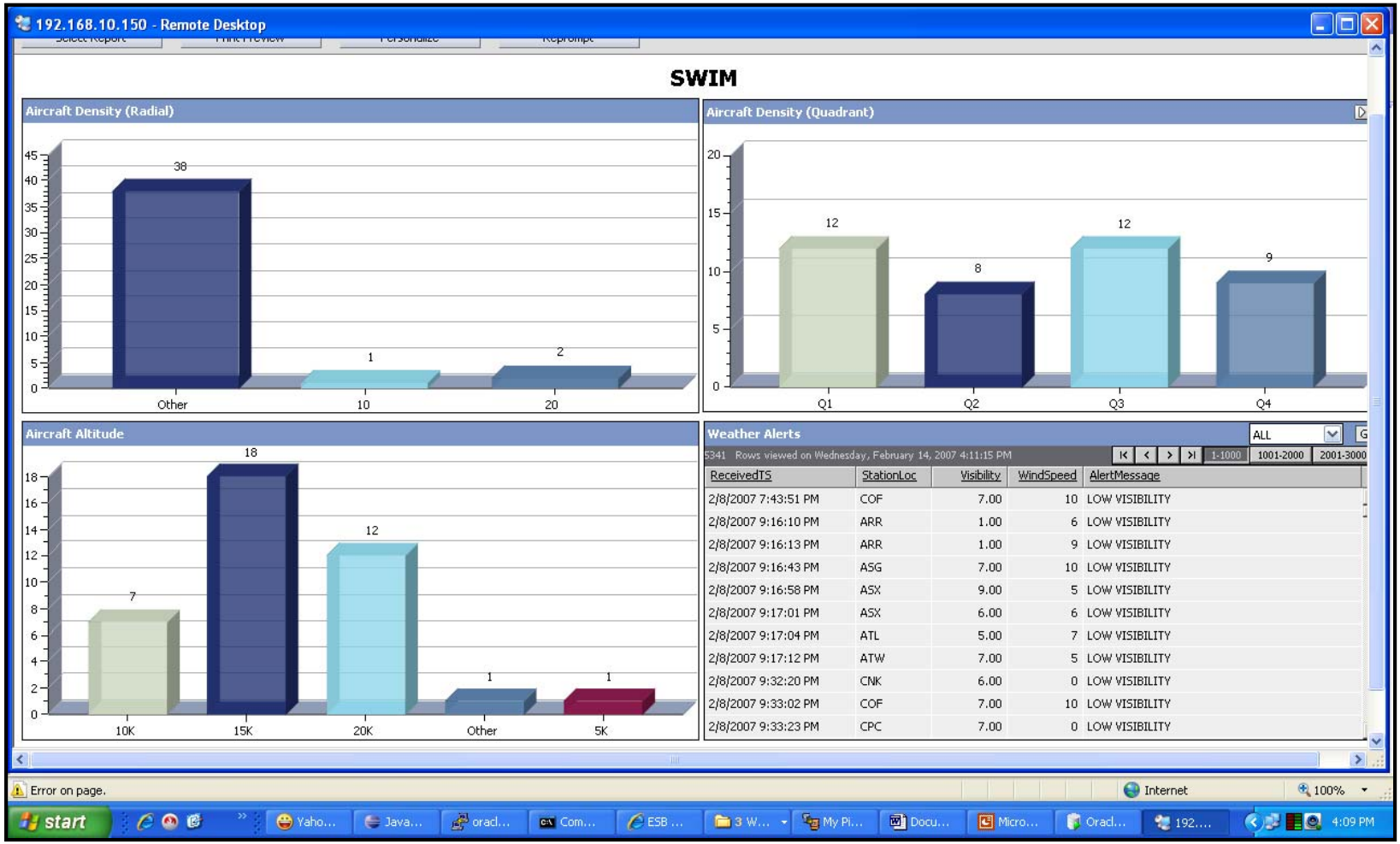
Solution provides a highly available and scalable infrastructure

Results – Focus Area #3: Security – Architecture



Solution provides security of information, users, and application access

Results – Focus Area #3: Security – Activity Monitoring



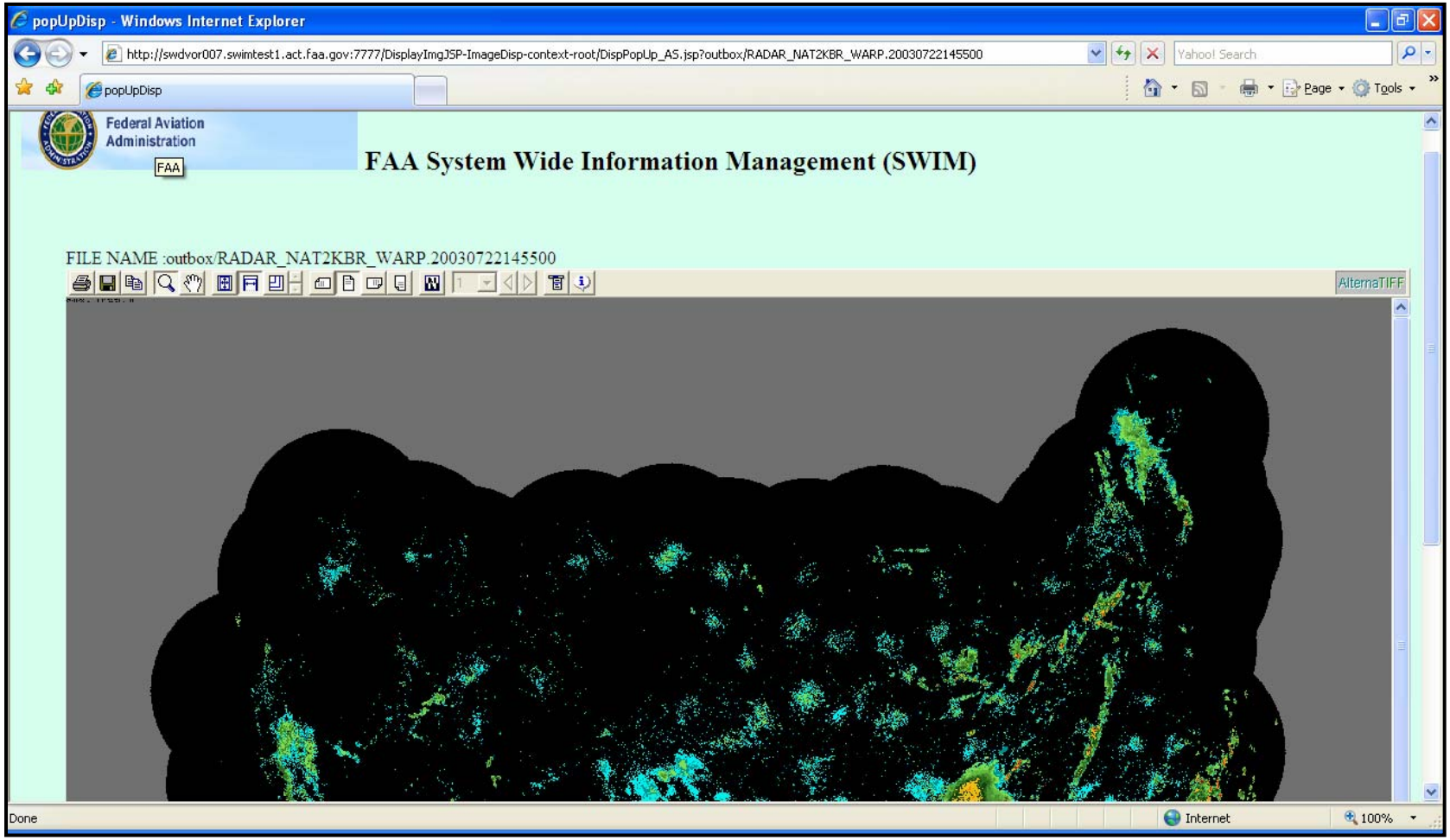
Business Activity Monitoring provides FAA users with real-time updates

Results – Focus Area #4: Weather – Use Cases

Functionality	Verified support for key weather actions: - Received image from WARP system - Accepted METAR weather data from two producers using different formats - Used COTS adapter for FTP transfers - Stored image in SWIM database - Displayed image on user screen	✓ Complete
Performance	Captured performance metrics to begin measuring these engineering stats: throughput, latency, and scalability	✓ Complete
Operational Event Triggering	Alerted users upon detection of severe weather that could affect operations	✓ Complete
Automatic Deletion	Automatically deleted old weather images from the SWIM database – based on a record-management retention policy	✓ Complete

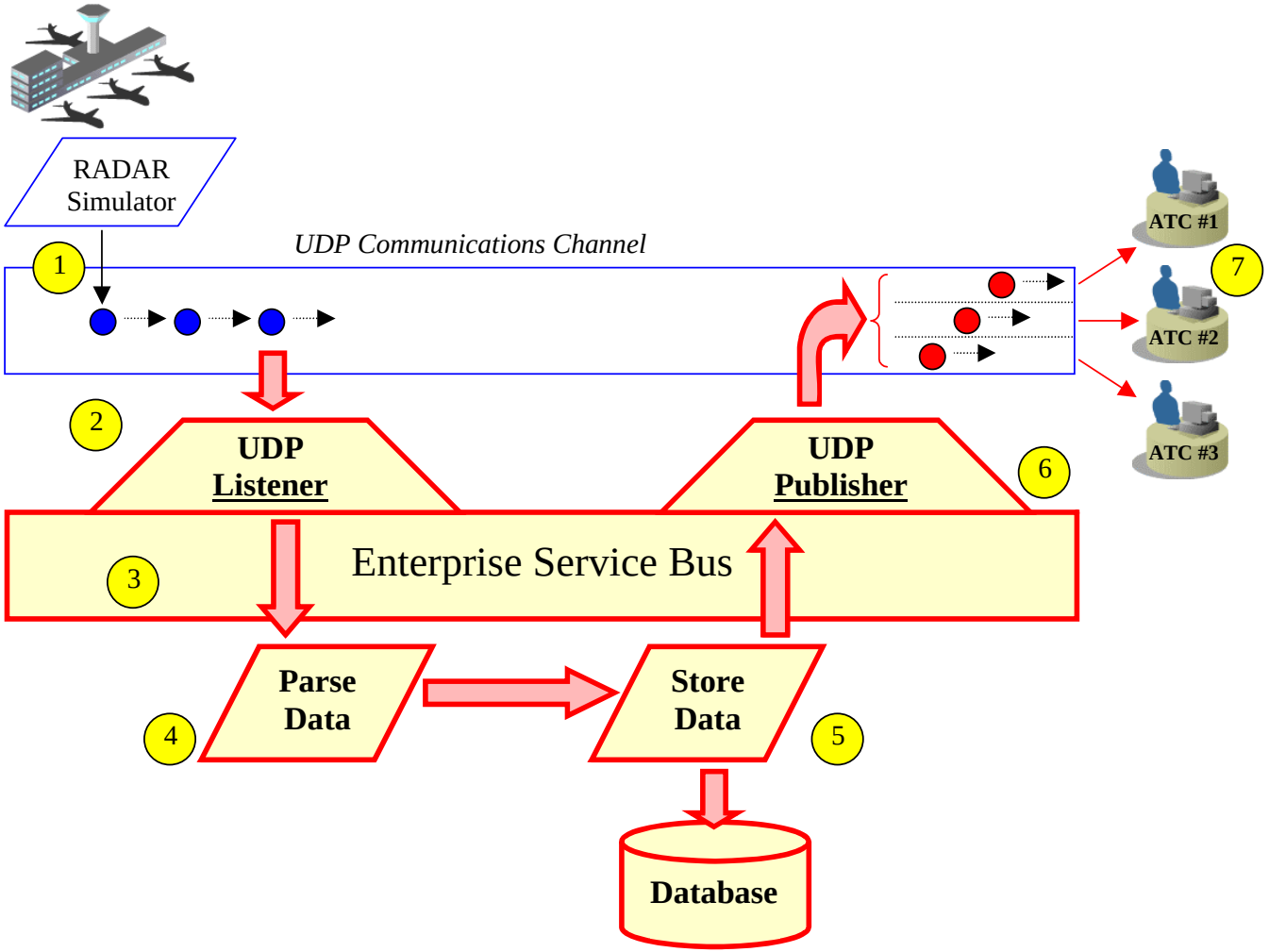
Solution receives, stores, and displays images from FAA weather system

Results – Focus Area #4: Weather – Screenshot



FAA users request weather images and display them in standard web browser

Results – Focus Area #5: Surveillance – Architecture

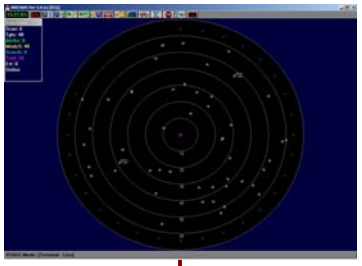


Solution receives, stores, and posts existing FAA surveillance transactions

Results – Focus Area #5: Surveillance – Screenshot

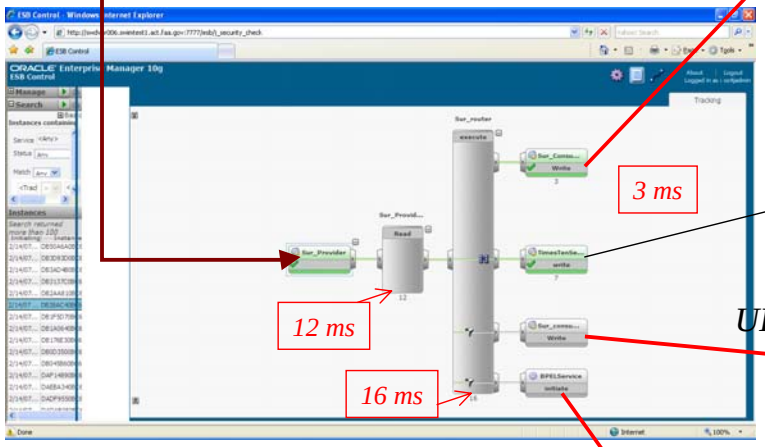
Input
FAA Radar

UDP-based Surveillance Source



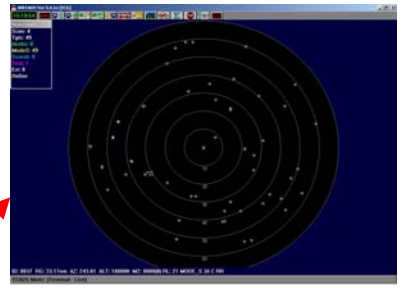
Throughtput: 100/scan

UDP



UDP

RTADS One



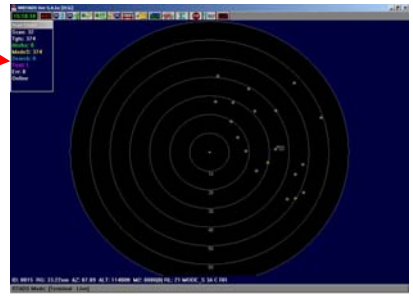
Output
ATC #1

All data

In-Memory DB (TimesTen)

RTADS Two

UDP



Output
ATC #2

Filtered data

BAM

User screens (RTADS) validate that SWIM output matches input sources

Results – Focus Area #6: Infrastructure Management

Monitoring	Used consolidated dashboard for management and trend-analysis of key infrastructure resources - Application Servers - Databases - Clusters - Storage	✓ Complete
Alert Notification	Alerted IT Administrator upon detection of simulated component outages: - Lost connection to SWIM server - Lost connection to SWIM database	✓ Complete

Solution provides FAA with consolidated dashboard to manage IT infrastructure

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Conclusions

✓ Quality	**COTS solution satisfied all FAA requirements for the initial evaluation project.**
✓ Cost	**COTS solution is very cost effective:** - Startup Costs are lower due to less labor necessary to integrate components of a "suite" solution - Maintenance Costs are lower due to vendor spreading support across all customers of the product set - Integration Costs are lower via leverage of pre-built connectors to legacy data sources and applications
✓ Schedule	**COTS project was completed in four months.**

Solution proved effective in all three evaluation areas: Quality, Cost, and Schedule

Next Steps

Communities of Interest	**Collect additional requirements from existing FAA "communities of interest" and extend the COTS solution to meet those COI requirements.**
Converge Architectures	**Converge this COTS system architecture with that of other FAA teams that are also working on SWIM solution design.**
Support Personnel	**Identify a long-term staffing solution for support of the COTS-based SWIM solution architecture.**

Extend this project's success to the broader FAA community


QUESTIONS
ANSWERS